

Board Administration and Regulatory Coordination Unit

Division 3. Air Resources Board

Chapter 9. Off-Road Vehicles and Engines Pollution Control Devices

Article 4. Heavy-Duty Off-Road Diesel Cycle Engines

§ 2423. Exhaust Emission Standards and Test Procedures--Heavy-Duty Off-Road Diesel Cycle Engines.

(a) This section shall be applicable to new heavy-duty off-road compression-ignition engines, produced on or after January 1, 1996, and all other new 2000 and later model year off-road compression-ignition engines. For the purposes of this section, these engines shall be called "compression-ignition engines."

(b)(1) Exhaust emissions from new off-road compression-ignition engines, sold in this state, shall not exceed the levels contained in Table 1. Table 1 follows:

Table 1. - Exhaust Emission Standards
(grams per kilowatt-hour)

<i>Maximum Rated Power (kW)</i>	<i>Tier</i>	<i>Model Year</i>	<i>NOx2</i>	<i>HC3</i>	<i>NMHC+NOx4</i>	<i>CO5</i>	<i>PM6</i>
kW<8	Tier 1	2000-2004	--	--	10.5	8.0	1.0
	Tier 2	2005 and later	--	--	7.5	8.0	0.80
8<UN->kW<19	Tier 1	2000-2004	--	--	9.5	6.6	0.80
	Tier 2	2005 and later	--	--	7.5	6.6	0.80
19<UN->kW<37	Tier 1	2000-2003	--	--	9.5	5.5	0.80
	Tier 2	2004 and later	--	--	7.5	5.5	0.60
37<UN->kW<75	Tier 1	2000-2003	9.2	--	--	--	--
	Tier 2	2004-2007	--	--	7.5	5.0	0.40
	Tier 3	2008 and later	--	--	4.7	5.0	--
75<UN->kW<130	Tier 1	2000-2002	9.2	--	--	--	--
	Tier 2	2003-2006	--	--	6.6	5.0	0.30
	Tier 3	2007 and later	--	--	4.0	5.0	--
130<UN->kW<225	Tier 1	1996-2002	9.2	1.3	--	11.4	0.54
	Tier 2	2003-2005	--	--	6.6	3.5	0.20
	Tier 3	2006 and later	--	--	4.0	3.5	--
225<UN->kW<450	Tier 1	1996-2000	9.2	1.3	--	11.4	0.54
	Tier 2	2001-2005	--	--	6.4	3.5	0.20
	Tier 3	2006 and later	--	--	4.0	3.5	--
450<UN->kW<UN->560	Tier 1	1996-2001	9.2	1.3	--	11.4	0.54
	Tier 2	2002-2005	--	--	6.4	3.5	0.20
	Tier 3	2006 and later	--	--	4.0	3.5	--
kW>560	Tier 1	2000-2005	9.2	1.3	--	11.4	0.54
	Tier 2	2006 and later	--	--	6.4	3.5	0.20

1. kW means kilowatts.

2. NOx means Oxides of Nitrogen.

3. HC means Hydrocarbons.

4. NMHC+NOx means Non-Methane Hydrocarbons plus Oxides of Nitrogen.

5. CO means Carbon Monoxide.

6. PM means Particulate Matter.

(2) Manufacturers may elect to include engine families in the averaging, banking, and trading program, the provisions of which are specified in the 2000 and Later Test Procedures. The manufacturer must set a family emission limit (FEL) not to exceed the levels contained in Table 2. The FEL established by the manufacturer serves as the standard for that engine family. Table 2 follows:

Table 2 - Upper Limit for Family Emission Limits (FEL)
(grams per kilowatt-hour)

<i>Maximum Rated Power (kW)</i>	<i>Tier</i>	<i>Model Year</i>	<i>Nox</i>	<i>NMHC+Nox</i>	<i>PM FEL</i>
kW<8	Tier 1	2000-2004		16.0	1.2
	Tier 2	2005 and later		10.5	1.0
8<UN->kW<19	Tier 1	2000-2004		16.0	1.2
	Tier 2	2005 and later		9.5	0.80

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19<UN->kW<37	Tier 1	2000-2003		16.0	1.2
	Tier 2	2004 and later		9.5	0.80
37<UN->kW<75	Tier 1	2000-2003	14.6		
	Tier 2	2004-2007		11.5	1.2
	Tier 3	2008 and later		7.5	
75<UN->kW<130	Tier 1	2000-2002	14.6		
	Tier 2	2003-2006		11.5	1.2
	Tier 3	2007 and later		6.6	
130<UN->kW<225	Tier 1	2000-2002	14.6		
	Tier 2	2003-2005		10.5	0.54
	Tier 3	2006 and later		6.6	
225<UN->kW<450	Tier 1	2000	14.6		
	Tier 2	2001-2005		10.5	0.54
	Tier 3	2006 and later		6.4	
450<UN->kW<UN->560	Tier 1	2000-2001	14.6		
	Tier 2	2002-2005		10.5	0.54
	Tier 3	2006 and later		6.4	
kW>560	Tier 1	2000-2005	14.6		
	Tier 2	2006 and later		10.5	0.54

(3)(A) The opacity of smoke emissions from new 1996 through 1999 model year heavy-duty off-road compression-ignition engines 175 to 750 horsepower, inclusive, or from all new 2000 and later model year compression-ignition engines sold in this state, shall not exceed:

1. 20 percent during the engine acceleration mode.
2. 15 percent during the engine lugging mode.
3. 50 percent during the peaks in either mode.

(B) The following engines are exempt from the requirements of this section:

1. Single-cylinder engines.
2. Propulsion marine compression-ignition engines.
3. Constant-speed engines.
- (4) Low-emitting Blue Sky Series engines requirements.

(A) *Voluntary standards.* Engines may be designated "Blue Sky Series" engines through the 2004 model year by meeting the voluntary standards contained in Table 3, which apply to all certification and in-use testing. Blue Sky Series engines shall not be included in the Averaging, Banking, and Trading program. Table 3 follows:

Table 3. - Voluntary Emission Standards
(grams per kilowatt-hour)

<i>Maximum Rated Power (kW)</i>	<i>NMHC+Nox</i>	<i>PM</i>
kW<8	4.6	0.48
8<UN->kW<19	4.5	0.48
19<UN->kW<37	4.5	0.36
37<UN->kW<75	4.7	0.24
75<UN->kW<130	4.0	0.18
130<UN->kW<UN->560	4.0	0.12
kW>560	3.8	0.12

(B) *Additional standards.* Blue Sky Series engines are subject to all provisions that would otherwise apply under this part, except as specified in (C) of this section.

(C) *Test Procedures.* NO_x, NMHC, and PM emissions are measured using the procedures set forth in 40 CFR part 86, subpart N (July 1, 1999), which is incorporated by reference, in lieu of the procedures set forth in subpart E of the 2000 and Later Test Procedures. CO emissions may be measured using procedures set forth in 40 CFR part 86, subpart N (July 1, 1999), or in subpart E of the 2000 and Later Test Procedures. Manufacturers may use an alternate procedure to demonstrate the desired level of control if approved in advance by the Executive Officer. Engines meeting the requirements to qualify as Blue Sky Series engines must be capable of maintaining a comparable level of emission control when tested using the procedures set forth in both Section 89.112(c) and

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subpart E of the 2000 and Later Test Procedures. The numerical emission levels measured using the procedures from subpart E of the 2000 and Later Test Procedures may be up to 20 percent higher than those measured using procedures from 40 CFR part 86, subpart N (July 1, 1999), and still be considered comparable.

(5) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1996-1999 model year heavy-duty off-road compression-ignition engine or any Tier 2 or later off-road engine. This provision does not apply to petroleum-fueled diesel cycle engines using turbochargers, pumps, blowers, or superchargers for air induction.

(c)(1) The test procedures for determining certification and compliance with the standards for gaseous exhaust emissions from new 1996-1999 heavy-duty off-road compression-ignition engines sold in the state are set forth in the 1996-1999 Heavy-Duty Test Procedures.

(2) The test procedures for determining certification and compliance with the standards for gaseous exhaust emissions and the standards for opacity of smoke emissions from new 2000 model year and later off-road compression-ignition engines sold in the state are set forth in the 2000 and Later Test Procedures.

(3) The test procedures for determining certification and compliance with the standards for particulate exhaust emissions from new 1996 and later off-road compression-ignition engines sold in the state are set forth in the PM and Test Cycle Test Procedures. (4) The test procedures for determining certification and compliance with the standards for the opacity of smoke emissions from new 1996-1999 off-road compression-ignition engines sold in the state are set forth in the 1996-1999 Smoke Test Procedures.

(d) *Implementation flexibility for equipment and vehicle manufacturers and post-manufacture marinizers.* Off-road equipment and vehicle manufacturers and post-manufacture marinizers may take any of the otherwise prohibited actions identified in the 2000 and Later Test Procedures (Section 89.1003(a)(1)) with respect to 2000 model year and later off-road equipment and vehicles and marine compression-ignition engines, subject to the requirements of paragraph

(e) of this section. The following allowances apply separately to each engine power category subject to standards under Section 2423(b)(1):

(1) *Percent-of-production allowances.*

(A) *Equipment rated at or above 37kW.* For off-road equipment and vehicles with engines rated at or above 37kW, a manufacturer may take any of the actions identified in the 2000 and Later Test Procedures (Section 89.1003(a)(1)) for a portion of its California-directed production volume of such equipment and vehicles during the seven years immediately following the date on which Tier 2 engine standards first apply to engines used in such equipment and vehicles, provided that the seven-year sum of the U.S.-directed portions in each year, as expressed as a percentage for each year, does not exceed 80, and provided that all such equipment and vehicles or equipment contain only Tier 1 engines;

(B) *Equipment rated under 37kW.* For off-road equipment and vehicles and marine diesel engines with engines rated under 37kW, a manufacturer may take any of the actions identified in the 2000 and Later Test Procedures (Section 89.1003(a)(1)) for a portion of its California-directed production volume of such equipment and vehicles during the seven years immediately following the date on which Tier 1 engine standards first apply to engines used in such equipment and vehicles, provided that the seven-year sum of the U.S.-directed portions in each year, as expressed as a percentage for each year, does not exceed 80.

(2) *Small volume allowances.* An off-road equipment or vehicle manufacturer or post-manufacturer marinizer may exceed the production percentages in paragraph (d)(1) of this section for a portion of its California-directed production, provided that in each regulated power category the manufacturer's total of U.S.-directed excepted off-road equipment and vehicles and marine diesel engines over the years in which the percent-of-production allowance applies:

(A) does not exceed 100 units times the number of years in which the percent-of-production allowance applies, and

(B) does not exceed 200 units in any year, and

(C) does not use engines from more than one engine family, or, for excepted equipment, vehicles, and marine diesel engines using engines not belonging to any engine family, from more than one engine manufacturer.

(3) *Inclusion of previous-tier engines.* Off-road equipment and vehicles and marine diesel engines built with previous tier or noncertified engines under the existing inventory provisions of the 2000 and Later Test Procedures

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(40 CFR Section 89.1003(b)(4)) need not be included in determining compliance with paragraphs (d)(1) and (d)(2) of this section.

(e) *Recordkeeping and calculation to verify compliance.* The following shall apply to off-road equipment or vehicle manufacturers and post-manufacture marinizers who produce excepted equipment or vehicles or marine diesel engines under the provisions of paragraph (d) of this section:

(1) For each power category in which excepted off-road equipment or vehicles or marine diesel engines are produced, a calculation to verify compliance with the requirements of paragraph (d) of this section shall be made by the off-road equipment or vehicle manufacturer or post-manufacturer marinizer. This calculation shall be made no later than December 31 of the year following the last year in which allowances are used, and shall be based on actual national production information from the subject years. If both the percent-of-production and small volume allowances have been exceeded, then the manufacturer is in violation of Section 2420(a)(3), except as provided under paragraphs (f) and (h) of this section.

(2) An off-road equipment or vehicle manufacturer or post-manufacturer marinizer shall keep records of all off-road equipment and vehicles and marine diesel engines sold in California and excepted under the provisions of paragraph (d) of this section, for each power category in which exceptions are taken. These records shall include equipment and engine model numbers, serial numbers, and dates of manufacture, and engine rated power. In addition, the manufacturer shall keep records sufficient to demonstrate the verifications of compliance required in paragraph (e)(1) of this section. All records shall be kept until at least two full years after the final year in which allowances are available for each power category, and shall be made available to the Executive Officer upon request.

(f) *Hardship relief.* Off-road equipment and vehicle manufacturers and post-manufacture marinizers may take any of the otherwise prohibited actions identified in Section 89.1003(b)(4) of the 2000 and Later Test Procedures, if approved by the Executive Officer or designee, and subject to the following requirements:

(1) The application for relief must be submitted for approval to the Chief of the Mobile Source Operations Division in writing prior to the earliest date in which the applying manufacturer would be in violation of Section 2423(b)(1). The off-road equipment or vehicle manufacturer applying for hardship relief must submit evidence for approval, showing that the following requirements have been met:

(A) The off-road equipment or vehicle manufacturer applying for hardship relief must not be the manufacturer of the engines used in the equipment for which relief is sought. This requirement does not apply to post-manufacturer marinizers.

(B) The conditions causing the impending violation must not be substantially the fault of the applying manufacturer.

(C) The conditions causing the impending violation must be such that the off-road equipment or vehicle manufacturer applying for hardship relief will experience serious economic hardship if relief is not granted.

(D) The off-road equipment or vehicle manufacturer applying for hardship relief must demonstrate that no allowances under paragraph (d) of this section will be available to avoid the impending violation.

(2) Any relief granted must begin within one year after the implementation date of the standard applying to the engines being used in the equipment, or to the marine diesel engines, for which relief is requested, and may not exceed one year in duration.

(3) The Executive Officer may impose other conditions on the granting of relief, including provisions to recover the lost environmental benefit.

(g) *Alternative Flexibility for Post-Manufacture Marinizers.* Post-manufacture marinizers may elect to delay the effective date of the Tier 1 standards for marine propulsion diesel engines rated under 37kW by one year, instead of using the provisions of paragraphs (d) and (f) of this section. Post-manufacture marinizers wishing to take advantage of this provision must inform the Executive Officer of their intent to do so in writing before the date that the standards would otherwise take effect.

(h) *Allowance for the production of engines.* Engine manufacturers may take any of the otherwise prohibited actions identified in the 2000 and Later Test Procedures (Section 89.1003(a)(1)) with regard to uncertified engines or Tier 1 engines, as appropriate, if the engine is required to meet the demand for engines created under paragraph (d), (f), or (g) of this section. Manufacturers shall provide to the Executive Officer annually, as part of the certification application, a list of the equipment manufacturers requesting such engines. The list shall include the equipment manufacturers' names, engine models, and volumes.

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(i) [Reserved]

(j)(1) A new compression-ignition off-road engine intended solely to replace an engine in a piece of off-road equipment that was originally produced with an engine manufactured prior to the applicable implementation date as specified in Section 2423, shall not be subject to the emission requirements of Section 2423 provided that:

(A) the engine manufacturer has ascertained that no engine produced by itself or the manufacturer of the engine that is being replaced, if different, and certified to the requirements of this article, is available with the appropriate physical or performance characteristics to repower the equipment; and

(B) unless an alternative control mechanism is approved in advance by the Executive Officer, the engine manufacturer or its agent takes ownership and possession of the engine being replaced; and

(C) the replacement engine is clearly labeled with the following language, or similar alternate language approved in advance by the Executive Officer:

THIS ENGINE DOES NOT COMPLY WITH CALIFORNIA AND FEDERAL OFF-ROAD OR ON-HIGHWAY EMISSION REQUIREMENTS. SALE OR INSTALLATION OF THIS ENGINE FOR ANY PURPOSE OTHER THAN AS A REPLACEMENT ENGINE FOR AN ENGINE MANUFACTURED PRIOR TO JANUARY 1 [INSERT APPROPRIATE YEAR] IS A VIOLATION OF CALIFORNIA AND FEDERAL LAW SUBJECT TO CIVIL PENALTY.

(2) At the conclusion of each of the 2000-2004 model years, the manufacturer must provide, by engine model, the actual number of replacement engines produced for California during the model year, and a description of the physical or performance characteristics of those models that indicate certified replacement engine(s) were not available as per paragraph (1). (k) Any new engine certified to comply with California emission standards and test procedures for on-road applications may, upon approval by the Executive Officer, be considered to be in compliance with these regulations.

NOTE: Authority cited: Sections 39600, 39601, 43013, 43018, 43101 and 43104, Health and Safety Code. Reference: Sections 43013, 43017, 43018, 43101, 43104 and 43211-43212, Health and Safety Code.

REFERENCE